selection of ND8955 was initiated in 1994 from 500 random F_{10} plants and grown as individual rows in 1995. Eighty-three plant rows were selected based on uniformity for spike type, plant height, and resistance to natural leaf rust infections (caused by *Puccinia triticina* Eriks.). In 1996, 75 of these selections were bulk harvested and designated ND8955-A. Both ND8955 and ND8955-A were tested at six North Dakota locations in 1997 and no significant differences were observed in their yield or other agronomically significant traits such as heading date or reaction to other diseases. The 1996 harvest of ND8955-A produced the Breeder seed used to initiate increase seed of Ransom.

Ransom is mid-maturity, similar to 'Roughrider.' The plant height of Ransom averaged 79 cm, compared with 74 cm for 'Arapahoe' and 84 cm for Seward. Ransom spikes are middense, fusiform, awned, and white at maturity. Glumes are medium length and width with rounded shoulders and acuminate beak. Seeds are ovate, with rounded cheeks and medium brush.

In 39 North Dakota trials from 1991 through 1997, the grain yield of Ransom averaged 3422 kg ha^{-1} which was 1% greater than Seward, 2% greater than Arapahoe, 3% greater than 'Elkhorn,' and 10% greater than Roughrider. Ransom was tested in the Northern Regional Performance Nursery from 1992 to 1994 (24 site–years across Minnesota, Montana, North Dakota, and South Dakota) and had an average grain yield of 3650 kg ha^{-1}, 4% greater than Elkhorn and 10% greater than Roughrider. Winterhardiness is similar to Seward, greater than Arapahoe, but less than Elkhorn and Roughrider. Straw strength is similar to Elkhorn and Roughrider and weaker than Seward.

Ransom has shown resistance to stem rust (caused by *Puccinia graminis* Pers.:Pers. f. sp. tritici Eriks & E. Henn.) races Pgt-QCCJ and -TPMK after inoculation of greenhouse-grown seedlings at moderate temperature (21°C), but susceptibility to these same races at high temperature (27–29°C). Field-grown adult plants have consistently shown resistance to the prevalent races of stem rust. Ransom is moderately resistant to prevalent races of leaf rust, but is more resistant than Roughrider or Seward. Ransom is susceptible to tan spot (caused by *Pyrenophora tritici-repentis* (Dred.) Drechs.).

The grain quality of Ransom has been tested by the Department of Cereal Science and Food Technology at North Dakota State University since 1992. Ransom has relatively low grain volume weight of 746 kg m^{-3}, which is less than Roughrider (764 kg m^{-3}) and Seward (755 kg m^{-3}). The grain protein content of Ransom (127 g kg^{-1}) is intermediate between Roughrider (136 g kg^{-1}) and Seward (121 g kg^{-1}). Flour extraction and mixograph water absorption are intermediate between Roughrider and Seward. Dough mixing properties and bread baking performance of Ransom are acceptable, similar to Arapahoe.

Cultivar protection of Ransom under the U.S. Plant Variety Protection Act is pending. Breeder and Foundation seed is maintained by the Seedstocks Project, Agric. Exp. Stn., North Dakota State Univ., Fargo, ND 58105-5051. U.S. Plant Variety Protection of Ransom wheat has been applied for (PVP certificate no. 9900250).

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References and Notes

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REGISTRATION OF GERMPLASM

Registration of Six Isogenic T1BL.1RS Chromosome Translocation and Six Chromosome 1B Durum Germplasms

The International Maize and Wheat Improvement Center announces the release of six pairs of durum (*Triticum turgidum* L. var. durum Desf) germplasms differing for the T1BL.1RS chromosome translocation. The chromosome T1BL.1RS translocation was transferred to six chromosome 1B durum wheat cultivars 'Laru,' 'Croc 1,' 'Dvergand 2,' 'Pardo,' 'Gutros,' and 'Bia.' For each cultivar, we are registering one chromosome 1B derived line, and one T1BL.1RS translocation line. Each line has the cross identification Cruza Intergenérica Mexicana (CIGM) number (Table 1) (Reg. no. GP-643 to GP-654; PI 614044 to PI 614055). Cando/Veery was the T1BL.1RS pollen donor for the F_1 generation. The homozygous selection was made in F_2 (1), and its F_6 derivative utilized here. Each F_1 heterozygote (1B, T1BL.1RS) was pollinated by its respective durum parent to yield the first backcross (BC_1) derivative. Two heterozygous BC_1 plants with 28 chromosomes (1B, T1BL.1RS) were identified by Glucose-phospho-isomerase (GPI) electrophoresis and Giemsa C-banding (2). All BC_1F_1 heterozygotes were backcrossed to their respective durums until the BC_7 generation and then self-pollinated. From the selfed progeny, plants homozygous for chromosomes 1B and T1BL.1RS were identified biochemically and cytologically.

The germplasms were developed by the Wide Cross program of the International Maize and Wheat Improvement Center (CIMMYT) in Mexico. All T1BL.1RS wheat germplasms possess disease resistance genes *Lr26, Sr31, Yr9*, and *Pm8* located on the rye (*Secale cereale*) chromosome arm 1RS (3). Since this chromosome has substituted 1B in the six durums, the above four genes are anticipated to be present.

The 1B derived lines of each cultivar are anticipated to differ from their parental stock for the recombination events occurring on the 1BL chromosome arm of the T1BL.1RS translocation and on the other 26 chromosomes during the backcross procedure (4) since a different durum cultivar was involved in the production of each 1B, T1BL.1RS F_1 heterozygote. There are two earlier reports of durum germplasms with T1BL.1RS translocation (1,4). The six durum germplasms being registered here enhance existing diversity, and shall further elucidate the contribution of the T1BL.1RS chromosome

Table 1. Six durum wheat cultivars where the homozygous 1B chromosome has been substituted by the T1BL.1RS translocation chromosome following seven backcrosses and a selfing.

Germplasm pedigree	Cross number	PI number	Homozygous BC_7 selfed status†
Laru//Cndo/Veery/3/7*Laru	CIGM 98.769-1	614044	1B
Laru//Cndo/Veery/3/7*Laru	CIGM 98.770-1	614045	T1BL.1RS
Croc1//Cndo/Veery/3/7*Croc1	CIGM 98.772-1	614046	1B
Croc1//Cndo/Veery/3/7*Croc1	CIGM 98.773-1	614047	T1BL.1RS
Dvergand2//Cndo/Veery/3/7*Dv.	CIGM 98.774-1	614048	1B
Dvergand2//Cndo/Veery/3/7*Dv.	CIGM 98.775-1	614049	T1BL.1RS
Pardo//Cndo/Veery/3/7*Pardo	CIGM 98.776-1	614050	1B
Pardo//Cndo/Veery/3/7*Pardo	CIGM 98.777-1	614051	T1BL.1RS
Gutros//Cndo/Veery/3/7*Gutros	CIGM 98.778-1	614052	1B
Gutros//Cndo/Veery/3/7*Gutros	CIGM 98.779-1	614053	T1BL.1RS
Bia//Cndo/Veery/3/7*Bia	CIGM 98.780-1	614054	1B
Bia//Cndo/Veery/3/7*Bia	CIGM 98.781-1	614055	T1BL.1RS

† 1B germplasms are isogenic 'extracted' lines. Isogenic T1BL.1RS lines are substitution derivatives.

translocation in different genetic stocks (2).

Seed samples (3g) of each germplasm will be distributed upon written request. Requests should be directed to the Genetic Resources Bank, Wheat Program, CIMMYT, Apartado Postal 6-641, 06600 Mexico, D.F., Mexico.

A. Mujeeb-Kazi,* A. Cortes, V. Rosas, S. Cano, and R. Delgado (5)

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Registration of 17 Isogenic Chromosome 1B and 17 T1BL.1RS Chromosome Translocation Bread Wheat Germplasms

Homozygous T1BL.1RS translocation wheats demonstrate an agronomic advantage over those lacking this chromosome under the most favorable conditions (1). Superiority of euploid 1B lines over T1BL.1RS germplasm has also been reported (2). The need to extend these contrasting observations to more diverse germplasms led us to produce 1B or T1BL.1RS backcross isogenic lines and extracted derivatives for 17 bread wheat cultivars that were either homozygous T1BL.1RS or 1B. For each 1B cultivar we produced an isogenic T1BL.1RS line and a 1B derivative line (Table 1A). Similarly for each T1BL.1RS cultivar, we produced an isogenic 1B line and a T1BL.1RS derivative (Table 1B). Wheat sources (3) that donated the T1BL.1RS chromosome to 1B cultivars were 'Glennson' and 'Seri M82.' 'Ciano T79' and 'Pavon 76' were the 1B chromosome donors to T1BL.1RS cultivars (Table 1). The 34 germplasms being registered are identified by a Cruza Intergenérica Mexicana (CIGM) number, (Reg. no. GP-655 to GP-688; PI 614010 to PI 614043). Each F_1 1B, T1BL.1RS heterozygote combination was pollinated by its respective bread wheat parent to yield the first backcross (BCI) derivative. Two heterozygous (1B, T1BL.1RS) BC_1 plants with 42 chromosomes were identified by Glucose-Phospho-Isomerase (GPI) electrophoresis and Giemsa C-banding (4). These BC_1F_1 heterozygotes were backcrossed to their respective bread wheats until the BC_7 generation, and then self-pollinated. From the selfed progeny, plants homozygous for chromosomes 1B and T1BL.1RS were identified biochemically (GPI and Acid Page; A-PAGE), and cytologically (Giemsa C-banding). Homozygous plants from each cultivar were then grown and seed increased. One derivative per combination is now being registered as isogenic 1B or T1BL.1RS germplasms (Table 1).

The germplasm was developed by the Wide Cross program of the International Maize and Wheat Improvement Center (CIMMYT) in Mexico. Since the complete T1BL.1RS chromosome has been substituted, we assume that each of the T1BL.1RS germplasms possess biotic stress resistance genes *Lr26, Sr31, Yr9*, and *Pm8* that are reportedly located on the rye (*Secale cereale*) chromosome arm 1RS (5). The 17 additional bread wheat germplasms being registered here enhance existing diversity, and further elucidate the contribution of T1BL.1RS translocation chromosome.

Seed samples (3g) of each germplasm will be distributed upon written request. Requests should be directed to the Genetic Resources Bank, Wheat Program, CIMMYT, Apartado Postal 6-641, 06600 Mexico, D.F., Mexico.

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Table 1. Seventeen pairs of isogenic bread wheat cultivars with substituted 1B or T1BL.1RS.

Pedigree	Line	PI number	Homozygous BC_7 selfed status
A. 1B homozygous bread wheats (A_1)			
Yaco/Glennson M81//8*Yaco	CIGM98.746-1	614010	1B
Yaco/Glennson M81//8*Yaco	CIGM98.747-1	614011	T1BL.1RS
Ciano T79/Glennson M81//8*Ciano T79	CIGM98.748-1	614012	1B
Ciano T79/Glennson M81//8*Ciano T79	CIGM98.749-1	614013	T1BL.1RS
Opata M85/Glennson M81//8*Opata M85	CIGM98.758-1	614014	1B
Opata M85/Glennson M81//8*Opata M85	CIGM98.759-1	614015	T1BL.1RS
Ocoroni F86/Glennson M81//8*Ocoroni F86	CIGM98.762-1	614016	1B
Ocoroni F86/Glennson M81/8*Ocoroni F86	CIGM98.762-2	614017	T1BL.1RS
Esmeralda M86/Glennson M81/8*Esmeralda M86	CIGM98.764-1	614018	1B
Esmeralda M86/Glennson M81//8*Esmeralda M86	CIGM98.765-1	614019	T1BL.1RS
Yecora F70/Seri M82//8*Yecora F70	CIGM98.742-1	614020	1B
Yecora F70/Seri M82//8*Yecora F70	CIGM98.743-1	614021	T1BL.1RS
Agatha/6*Yecora//Seri M82/3/8*Aga/6*Y4	CIGM98.744-1	614022	1B
Agatha/6*Yecora//Seri M82/3/8*Aga/6*Y4	CIGM98.745-1	614023	T1BL.1RS
Mirlo/BuckBuck//Seri M82/3/8*Mirlo/BuckBuck	CIGM98.754-1	614024	1B
Mirlo/BuckBuck//Seri M82/3/8*Mirlo/BuckBuck	CIGM98.755-1	614025	T1BL.1RS
Pfau/Seri M82//8*Pfau	CIGM98.756-1	614026	1B
Pfau/Seri M82//8*Pfau	CIGM98.757-1	614027	T1BL.1RS
BuckBuck//Maya/Moncho/3/Seri M82/4/8*/BuckBuck//Maya/Moncho	CIGM98.766-1	614028	1B
BuckBuck//Maya/Moncho/3/Seri M82/4/8*/BuckBuck//Maya/Moncho	CIGM98.766-2	614029	T1BL.1RS
B. T1BL.1RS homozygous bread wheats (B_1)			
Glennson M81/Ciano T79//8*Glennson M81	CIGM98.737-1	614030	1B
Glennson M81/Ciano T79//8*Glennson M81	CIGM98.738-1	614031	T1BL.1RS
Bagula/Ciano T79//8*Bagula	CIGM98.741-1	614032	1B
Bagula/Ciano T79//8*Bagula	CIGM95.2589-1	614033	T1BL.1RS
Bobwhite/Ciano T79//8*Bobwhite	CIGM98.760-1	614034	1B
Bobwhite/Ciano T79//8*Bobwhite	CIGM98.761-1	614035	T1BL.1RS
Spinebill/Pavon 76//8*Spinebill	CIGM98.739-1	614036	1B
Spinebill/Pavon 76//8*Spinebill	CIGM98.740-1	614037	T1BL.1RS
Fink/Pavon 76//8*Fink	CIGM98.750-1	614038	1B
Fink/Pavon 76//8*Fink	CIGM98.751-1	614039	T1BL.1RS
Kauz/Pavon 76//8*Kauz	CIGM98.752-1	614040	1B
Kauz/Pavon 76//8*Kauz	CIGM98.753-1	614041	T1BL.1RS
Veery 10/Pavon76//8*Veery 10	CIGM98.769-1	614042	1B
Veery 10/Pavon//8*Veery 10	CIGM98.768-1	614043	T1BL.1RS

Int. Maize and Wheat Improv. Cent. (CIMMYT), Apartado Postal 6-641, 06600 Mexico, D.F., Mexico. Registration by CSSA. Accepted 30 Sept. 2000. *Corresponding author (m.kazi@cgiar.org).

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Registration of FL-NSC Rye Germplasm with Short Culm or Straw Length

FL-NSC rye (*Secale cereale* L.) germplasm (Reg. no. GP-2, PI 613129), which has short culm or straw length, was developed and released by the Florida Agricultural Experiment Station.

This spring, diploid germplasm was derived from a cross between a short culm (mean = 66 cm) population of unknown parentage developed by Dr. Calvin Newton (1) and a normal long culm (mean = 143 cm) cultivar 'Florida 401' (2, 3). More than 15 cycles of recurrent phenotypic selection, each involving over 1000 space plants, were used in the development of FL-NSC rye. In each cycle, individual plants were selected for short culm length, adaptation to the southeastern USA, spring growth habit, early forage production, and acceptable grain yield with the undesirable plants eliminated before pollination. The culm length of FL-NSC is slightly longer (mean = 73 cm) and more variable than the short culm parent. Short culm length was reported to be partially dominant and controlled by three loci with moderate broad and narrow sense heritability values (4). FL-NSC possesses many of the characteristics of Florida 401, which were described previously (2, 3). At its present stage of development, FL-NSC is unacceptable for commercial use in the southeastern USA because of its low forage and grain yield.

Small quantities (50 g) of seed of this germplasm line are available to breeders and geneticists. Written requests should be addressed to the corresponding author. Recipients of the seed are asked to make appropriate recognition of the source of FL-NSC if it is used in the development of a new cultivar, germplasm, parental line or genetic stock.

P.L. Pfahler,* R.D. Barnett, and A.R. Blount (5)

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Registration of Early-Maturing Fresh Seed Dormant Peanut Germplasm ICGV 93470

ICGV 93470 (Reg. no. GP-102, PI 614087) is an improved Spanish peanut (*Arachis hypogaea* L. subsp. *fastigiata* var. *vulgaris*) germplasm, developed at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Center, Patancheru, Andhra Pradesh, India. This improved germ-

plasm was released by the Plant Materials Identification Committee of ICRISAT in 1999 for its early-maturity and fresh seed dormancy in a Spanish background.

ICGV 93470 originated from a cross between ICGV 86015 (PI 585005) and ICGV 86155 (PI 594969) made in the 1990 rainy season at ICRISAT. ICGV 86015 is an early-maturing, high-yielding Spanish germplasm developed at ICRISAT from a cross between ICGS 44 and TG 2E (2). ICGV 86155 is an improved Spanish germplasm with 4-wk postmaturity fresh seed dormancy developed at ICRISAT from ICGS 30/('TMV 10'/Chico F_6 breeding line) cross (3). ICGV 93470 arose from a selection made in the F_3 generation of progeny from a single F_2 plant. Phenotypically similar early-maturing, high-yielding F_4 plants in the progeny from F_3 plants were mass selected and bulked at harvest. The process of bulking phenotypically similar plants (mass selection) was repeated until the F_6 generation when the bulk became phenotypically homogeneous. Its pedigree is ICGV 86015/ICGV86155 F_2–P_{46}–P_2–B_1–B_1 (where P refers to single plant selection and B refers to bulk selection).

ICGV 93470 matures in 95 to 100 d after planting (DAP) at ICRISAT, 5 to 10 d earlier than the early-maturing popular cultivar in India 'JL 24.' ICGV 93470 was evaluated for yield in 1994, 1995, 1996, and 1997 rainy seasons, and 1994-1995, 1995-1996, and 1996-1997 postrainy seasons at ICRISAT. It produced an average pod yield of 2.11 t ha^{-1}, 29.4% more than JL 24.

ICGV 93470 was evaluated after harvest in the laboratory for germination of fresh seeds in 1994, 1995, 1996, and 1997 rainy seasons, and 1994-1995, 1995-1996, and 1996-1997 postrainy seasons. One-week cured seed of ICGV 93470 were also evaluated for germination in the laboratory in all the seasons except 1995 rainy season. Each test was repeated three times with 30 seeds in each repeat. The average cumulative fresh seed germination was 4.0% after 3 wk and 6.1% after 4 wk, compared with 0.8 and 1.5% in the dormant control 'M 13' and 64.4 and 70.3% in the nondormant control JL 24, respectively. The average cumulative cured seed germination after 2 wk of incubation was 22.6% in ICGV 93470, compared with 16.7% in M 13 and 86.7% in JL 24. Further, ICGV 93470 was also evaluated for insitu sprouting in field after maturity by repeated irrigation in the 1996 and 1997 rainy seasons and 1994 to 1995 and 1995 to 1996 postrainy seasons. The average cumulative insitu field sprouting 10 d after maturity was 0.7% in ICGV 93470, compared with 0.0% in M 13 and 43.0% in JL 24.

In ICGV 93470, the number of primary branches ranges between five and six. The number of secondary branches is two. It has an erect growth habit and elliptical medium sized dark-green leaves (1). Its main stem is ≈14 cm long, with a canopy width of ≈39 cm when measured at 90 DAP in the postrainy season at ICRISAT. Its pods are mainly two seeded, small in size averaging 27 mm length and 13 mm breadth, with a slight beak, moderate constriction, and slight reticulation. The average meat content is 71% compared with 63% of JL 24. Its seed has a tan testa color, weigh 47 g 100 $seed^{-1}$ compared with 42 g 100 $seed^{-1}$ for JL 24. Seed of ICGV 93470 average 46.3% oil and 23.8% protein.

ICGV 93470 is an early-maturing, high-yielding germplasm with fresh seed dormancy in a Spanish background. It can be used as an improved source of earliness and fresh seed dormancy in germplasm enhancement programs. Because of its postharvest fresh seed dormancy, it can also be cultivated in areas where the crop is often caught in rains at harvest resulting in insitu germination, loss of yield, and deterioration of seed quality.

Breeder seed of ICGV 93470 will be maintained by the Genetic Resources Unit, Genetic Resources and Enhancement Program, ICRISAT Center, Patancheru P.O., Andhra Pradesh 502 324, India. Limited quantities of seed of ICGV 93470 are available upon request for research. Seed of this line are also deposited with the U.S. National Seed Storage Laboratory, 1111 S. Mason St., Fort Collins, CO 80521-4500.

H.D. Upadhyaya,* S.N. Nigam, A.G.S. Reddy, and N. Yellaiah (4)

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Registration of Early-Maturing, Moderately Resistant to Rust Peanut Germplasm ICGV 94361

ICGV 94361 (Reg. no. GP-101, PI 614086) is an improved Spanish peanut (*Arachis hypogaea* L. subsp. *fastigiata* var. *vulgaris*) germplasm, developed at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Center, Patancheru, Andhra Pradesh, India. This improved germplasm was released by the Plant Materials Identification Committee of ICRISAT in 1999 for its early maturity and less susceptibility to rust (caused by *Puccinia arachidis* Speg.) than the popular cultivars in India TMV 2 and JL 24.

ICGV 94361 originated from a cross between ICGV 86124 and 'ICG (FDRS) 10' made in the 1990-91 postrainy season at ICRISAT. ICGV 86124 is an early-maturing, high-yielding Spanish breeding line developed at ICRISAT from 'JL 24'/(Dh 3-20/Robut 33-1 F_8 breeding line) cross. ICG (FDRS) 10 ('ICGV 87160' PI 478787) is a Spanish peanut resistant to rust and tolerant to late leaf spot [caused by *Phaeoisariopsis personata* (Berk. & M.A. Curtis) Arx; syn. *Cercosporidium personatum* (Berk & M.A. Curtis) Deighton]. It was developed at ICRISAT from a cross between Ah 65, a Spanish germplasm, and a rust resistant valencia germplasm NC Ac 17090 (4) and released for rainy season cultivation in peninsular India, where rust and late leaf spot are problems (2). ICGV 94361 arose from a single plant selection made in the F_2 generation of the cross ICGV 86124/ICG (FDRS) 10. Phenotypically similar early-maturing, high-yielding F_3 plants in the progeny from the F_2 plant were mass selected and bulked at harvest. The process of bulking phenotypically similar plants was repeated in following generations up to F_7 when the bulk became homogeneous. Its pedigree is ICGV 86124/ICG (FDRS) 10 F_2-P_{75}-B_1-B_1-B_1-B_1 (where P refers to single plant selection and B refers to bulk selection).

ICGV 94361 was evaluated against rust and late leaf spot under artificially inoculation of spreader rows in 1995, 1996, and 1997 rainy seasons at ICRISAT. In six trials, 75 to 80 d after planting (DAP), ICGV 94361 showed an average rating of 4.4 on a field scale of 1 to 9 (where 1 = no disease and 9 = 81–100% foliage damaged) against rust compared with 5.6 of susceptible control 'TMV 2' and 2.3 of resistant control

ICG (FDRS) 10 and 2.0 of ICGV 86699 (3). Against late leaf spot, it showed an average rating of 5.3 compared with 5.8 of susceptible control TMV 2, 4.3 of resistant control ICGV 86699, and 5.3 of tolerant control ICG (FDRS) 10. ICGV 94361 was also evaluated under natural conditions in farmers' fields along with TMV 2 and farmers' cultivars in districts of Anantpur, Kurnool, and Nalgonda, Andhra Pradesh, India in the 1996 rainy season. In 24 trials, ICGV 94361 showed an average rating of 4.0 for rust compared with 5.5 for TMV 2 and 5.6 for the farmers' cultivar, and 6.2 for late leaf spot compared with 7.5 for TMV 2 and the farmers' cultivars.

ICGV 94361 matures in 90-95 DAP at ICRISAT, 10 d earlier than the early-maturing popular cultivar JL 24. It was evaluated in two rainy and two postrainy seasons in replicated trials at ICRISAT, which were harvested when the crop accumulated 1240 °Cd (degree days) (equivalent to 75 DAP in the rainy season at ICRISAT) and 1470 °Cd (equivalent to 90 DAP in the rainy season at ICRISAT). ICGV 94361 produced an average pod yield of 1.66 t ha^{-1} at 1240 °Cd harvest, 33.9% more than JL 24, and 2.16 t ha^{-1} at 1470 °Cd harvest, 20.7% more than JL 24. The increase in pod yield from 1240 °Cd harvest to 1470 °Cd harvest was 30.1% in ICGV 94361 compared with 44.4% in JL 24. The lower increase in pod yield from 1240 °Cd harvest to 1470 °Cd harvest reflected inherent early-maturity of ICGV 94361 compared with JL 24.

In ICGV 94361, the number of primary branches ranges between six and seven. The average number of secondary branches is one. It has an erect growth habit and elliptical medium sized dark green leaves (1). Its main stem is ≈17 cm long, with a canopy width of ≈31 cm when measured at 90 DAP in the postrainy season at ICRISAT. Its pods are mainly two seeded (3 rare), small in size averaging 30 mm length and 13 mm breadth, with a slight constriction, slight reticulation, and without beak. The average meat content is 70%. Its seed has a tan testa color, weigh 38 g 100 seed^{-1} and average 47.0% oil and 21.7% protein.

ICGV 94361 is an early-maturing rust and late leaf spot tolerant high-yielding germplasm. It can be grown in areas or situations where these diseases are problems, and the growing season is short. Because of its earliness, it can escape the build up of various diseases and insect pests late in the season. It can also be used as an improved source of earliness in a germplasm enhancement program.

Breeder seed of ICGV 94361 will be maintained by the Genetic Resources Unit, Genetic Resources and Enhancement Program, ICRISAT Center, Patancheru P.O., Andhra Pradesh 502 324, India. Limited quantities of seed of ICGV 94361 are available upon request for research. Seed of this line are also deposited with the U.S. National Seed Storage Laboratory, 1111 S. Mason St., Fort Collins, CO 80521-4500.

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Registration of *Aspergillus flavus* Seed Infection Resistant Peanut Germplasm ICGV 91278, ICGV 91283, and ICGV 91284

Improved Spanish peanut (*Arachis hypogaea* L. subsp. *fastigiata* var. *vulgaris*) germplasm ICGV 91278 (Reg. no. GP-98, PI 614083), ICGV 91283 (Reg. no. GP-99, PI 614084), and ICGV 91284 (Reg. no. GP-100, PI 614085) were developed at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Center, Patancheru, Andhra Pradesh, India. These lines were released by the Plant Materials Identification Committee of ICRISAT in 1999 for resistance to natural seed infection and invitro seed colonization by the aflatoxin-producing fungus *Aspergillus flavus* (Link:Fr).

ICGV 91278, ICGV 91283, and ICGV 91284 originated from the following three crosses, respectively, 'JL 24'/UF 71513-1, U 4-7-5/JL 24, and 'J 11'/ICGV 86184. The first two crosses were made in the 1986-87 postrainy season and the third in the 1985 rainy season at ICRISAT. JL 24 is an early-maturing popular cultivar in India (6). It is susceptible to seed infection and seed colonization by *A. flavus*. UF 71513-1 is a selection from UF 71513, a valencia (subsp. *fastigiata* var. *fastigiata*) line from the USA. It is resistant to seed infection and seed colonization by *A. flavus* (2). U 4-7-5 is susceptible to seed colonization by *A. flavus* (2), but supports only low levels of aflatoxin production (4). J 11 is a widely grown cultivar in western and central India and is resistant to seed infection and seed colonization by *A. flavus* (3). J 11 is also resistant to seed infection by *A. flavus* in Senegal (9) and Thailand (8) and is being used in breeding programs of these countries (7). ICGV 86184 is a breeding line developed at ICRISAT from Faizpur 1-5/UF 71513-1 cross. It is interesting to note that both of ICGV 91283 parents, U 4-7-5 and JL 24, are susceptible to seed colonization by *A. flavus*. In selection of these lines (ICGVs 91278, 91283, and 91284), the phenotypically similar high-yielding F_2 plants in each cross were mass selected and bulked together at harvest. In all three crosses, the process of bulking phenotypically similar plants (mass selection) was repeated until F_8 generation when the bulks became phenotypically homogeneous. The pedigrees of these germplasm lines are as follows: ICGV 91278, JL 24/UF 71513-1 F_2-B_1-B_2-B_1-B_1-B_1-B_1; ICGV 91283, U 4-7-5/JL 24 F_2-B_1-B_1-B_1-B_1-B_1-B_1; ICGV 91284, J 11/ICGV 86184 F_2-B_1-B_1-B_1-B_1-B_1-B_1 (where B refers to bulk selection).

ICGV 91278, ICGV 91283, and ICGV 91284 were evaluated in the field for *A. flavus* seed infection (3) in three rainy seasons under rain-fed conditions and two postrainy seasons under imposed late-season drought conditions, and for seed colonization in all of these five seasons (3,5). The average natural seed infection was 0.8% in ICGV 91278, 1.3% in ICGV 91283, and 0.7% in ICGV 91284 compared with 0.9% in the resistant control J 11 and 11.2% in the susceptible control JL 24. The seed colonization by *A. flavus* under artificial inoculation conditions in the laboratory averaged 18.4% in ICGV 91278, 15.4% in ICGV 91283, and 16.7% in ICGV 91284 compared with 13.6% in J 11 and 46.6% in JL 24.

These three lines were evaluated for pod yield in two rainy and three postrainy seasons, in replicated trials at ICRISAT

and other locations. ICGV 91278, ICGV 91283, and ICGV 91284 produced an average pod yield of 2.16, 2.39, and 2.17 t ha^{-1}, respectively. These yields represent 12.5, 24.5, and 13.0% increase over J 11. Each line takes about 100 to 105 d after planting (DAP) to mature in the rainy season at ICRISAT, which is 10 to 15 d earlier than J 11.

The number of primary branches ranges between six and seven in these lines. The number of secondary branches ranges between one and two in ICGV 91278, and three and four in ICGV 91284. In ICGV 91283 it is only one. All lines have an erect growth habit and elliptical medium sized leaves (1). The leaf color is green in ICGV 91278 and ICGV 91284 and light-green in ICGV 91283. The height of main stem is ≈30 cm in ICGV 91278 and ICGV 91284, and ≈18 cm in ICGV 91283 at 90 DAP during the postrainy season. Canopy width is ≈43 cm in ICGV 91278, ≈44 cm in ICGV 91283, and ≈57 cm in ICGV 91284.

All three lines have small sized (24–26 mm average length and 11–13 mm average breadth) two-seeded pods with an occasional three-seeded pod in ICGV 91278. Pods of ICGV 91278 and ICGV 91284 have a slight beak, moderate constriction, and slight reticulation. Pod beak, constriction, and reticulation are moderate in ICGV 91283. The average meat content is 70% in ICGV 91278 and ICGV 91283 and 71% in ICGV 91284. Their seeds have tan testa color, which weigh 40 to 41 g 100-$seed^{-1}$ in ICGV 91278 and ICGV 91283 and 33 g 100-$seed^{-1}$ in ICGV 91284. The average oil content is 46.5, 48.7, and 47.0% and average protein content 27.2, 23.8, and 22.3%, respectively for ICGV 91278, ICGV 91283, and ICGV 91284.

ICGV 91278, ICGV 91283, and ICGV 91284 are high-yielding germplasm lines and can be grown in areas where peanut is exposed to end-of-season drought, conducive to aflatoxin contamination through preharvest seed infection by *A. flavus*. These germplasms can also be used as improved sources of resistance in a genetic enhancement program.

Breeder seed of ICGV 91278, ICGV 91283, and ICGV 91284 will be maintained by the Genetic Resources Unit, Genetic Resources and Enhancement Program, ICRISAT Center, Patancheru P.O., Andhra Pradesh 502 324, India. Limited quantities of seed of these lines are available upon request for research. Seed of each line are also deposited with the U.S. National Seed Storage Laboratory, 1111 S. Mason St., Fort Collins, CO 80521-4500.

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Registration of N313, N314, and N315 Sorghum Germplasm Lines

N313, N314, and N315 sorghum [*Sorghum bicolor* (L.) Moench] germplasm lines (Reg. no. GP-587, PI 612984; GP-588, PI 612985; and GP-589, PI 612986) were developed jointly by the USDA-ARS and the Agricultural Research Division, Institute of Agriculture and Natural Resources, University of Nebraska, and were released in July 1999.

N313, N314, and N315 are derivatives of IA28 (Atkins, 1983). They were developed with the goal of capturing the heterotic potential of IA28 in pollinator lines with white seed and tan plant color. N313 is an F5 selection from the cross zerazera *ms*3 population × IA28. N314 and N315 are F6 selections from a single F3 family derived from the cross IA28 × SDS3953. SDS3953 is a line obtained in 1984 by Dr. William Ross (USDA-ARS, retired) from Dr. L.M. Mazhani of Botswana. SDS3953 exhibits large panicles, and was used as a source of white seed and tan plant color. All three germplasms are fertility restorers in A1 cytoplasm. Descriptive data for these germplasms was collected at Mead, NE (Table 1). The three germplasms have white seeds and normal endosperm, and do not have pigmented testa. N313 has purple plant color. N314 and N315 have tan plant color. All three germplasms

Table 1. Characteristics of N313, N314, and N315 grown at Ithaca, NE, in 1998.

	Seed color	Endosperm	Plant color	Awns	Testa	Culms	Days to anthesis†	Height	Seed set‡	Test weight	Yield
				—— +/− ——			d	cm	%	kg/m^{-3}	kg/ha
N313	**White**	**Normal**	**Purple**	**–**	**–**	**Juicy**	**88**	**109**	**100**	**644**	**6300**
N314	**White**	**Normal**	**Tan**	**–**	**–**	**Juicy**	**94**	**98**	**100**	**669**	**7400**
N315	**White**	**Normal**	**Tan**	**–**	**–**	**Juicy**	**92**	**104**	**100**	**618**	**6066**
BWheatland							**82**	**116**	**100**	**682**	**7850**
$LSD_{P=0.05}$							**1**	**6**	**18**	**103**	**980**

† Days from planting to 50% anthesis.
‡ Percentage self seed set under pollinating bag.

are awnless, have juicy culms, were 6 to 12 d later in maturity than BWheatland, and are 7 to 18 cm shorter than BWheatland. When crossed to AWheatland, the three hybrids were 5 to 9 cm shorter, and 1 d earlier to 3 d later in maturity than AWheatland × RTx430 (Table 2). All three hybrids produced grain yields equivalent to AWheatland × RTx430. N315 was observed to exhibit excellent panicle exsertion, and to produce hybrids that exhibited excellent panicle exsertion. Reactions of these germplasm lines to specific insects or diseases have not been determined. These germplasms are a source of IA28 derived materials in plant types adapted to the northern portion of the U.S. sorghum production region, and are suited for the production of high quality grain for feed or food. They have immediate application as sources of white seed (N313, N314, N315) and tan plant color (N314, N315) in a heterotic background.

Seed of these germplasm lines will be maintained and distributed by the USDA-ARS, Wheat, Sorghum, and Forage Research Unit, Department of Agronomy, University of Nebraska, Lincoln, Nebraska 68583-0937, and will be provided without cost to each applicant on written request. Requests from outside the USA must be accompanied by an import permit. Genetic material of these releases will be deposited in the National Plant Germplasm System where it will be available for research purposes, including development and commercialization of new varieties/cultivars. It is requested that appropriate recognition be made if this germplasm contributes to the development of a new breeding line or cultivar.

J.F. Pedersen* and J.J. Toy (2)

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Registration of Three Rust Resistant Sunflower Germplasm Populations

Three sunflower (*Helianthus annuus* L.) germplasm populations were developed and released by the USDA-ARS, Fargo, ND, and the North Dakota Agricultural Experiment Station, Fargo, ND. HA-R6 (Reg. no. GP-251, PI 607509) is a confection maintainer population, HA-R7 (Reg. no. GP-252, PI 607510) is a confection restorer population, and HA-R8 (Reg. no. GP-253, PI 607511) is an oilseed restorer population, released in 1997. These three populations are resistant to race 777 of rust (caused by *Puccinia helianthi* Schw.) (1). Race 777 is the most virulent North American race, infecting all nine standard rust differentials. Race 777 was collected from wild *H. annuus* plants in Texas and from cultivated sunflower plants in Kansas in 1995. A single pustule isolate of this race was purified from the sample collected from cultivated sunflower in Kansas and used to determine reaction type (2). Plants of the HA-R6, HA-R7, and HA-R8 germplasm populations had an immune reaction (no uredia) to race 777.

Table 2. Mean performance of AWheatland × N313, N314, and N315 hybrids grown at Ithaca, NE, in 1998 and 1999.

	Days to anthesis†	Height	Seed set‡	Test weight
	d	cm	%	kg/m^{-3}
AWheatland × N313	78	135	94	776
AWheatland × N314	82	131	98	799
AWheatland × N315	81	135	100	781
AWheatland × Tx430	79	140	90	778
$LSD_{P=0.05}$	1	3	9	29

† Days from planting to 50% anthesis.
‡ Percentage self seed set under pollinating bag.

HA-R6 and HA-R7 are bulks of F_3-derived F_4 plants selected from the crosses HA 323/Ames 3234 and RHA 324/Ames 3234, respectively. HA 323 is a confection maintainer line and RHA 324 is a confection restorer line released by the USDA-ARS and the North Dakota Agricultural Experiment Station in 1985 (3,4). Ames 3234 is an accession from France named 6 SC U6 L6 and is maintained at the USDA Plant Introduction Station, Ames, IA. Plants of HA-R6 were selected for confection seed type, lodging resistance, and single-headed plant type. Plants of HA-R7 were selected for confection seed type, lodging resistance, and recessive upper-stem branching.

HA-R8 is a bulk of F_4-derived F_5 plants selected from the cross RHA 377/PI 432512. RHA 377 is an oilseed restorer line released by USDA-ARS and the North Dakota Agricultural Experiment Station in 1990 (5). PI 432512 is a plant introduction collected from the Havasupai Indian Reservation, Supai Village, Grand Canyon, Coconino Co., AZ, and is maintained at the USDA Plant Introduction Station, Ames, IA. Plants were selected for upper-stem branching, absence of anthocyanin in the seed coat, lodging resistance, oil content, and adaptability to the central and northcentral sunflower production areas of the USA. Seed has a striped seed coat.

The sources HA-R6, HA-R7, and HA-R8 represent the first USDA-ARS germplasm with resistance to rust race 777. These sources should afford sunflower breeders an opportunity to incorporate rust resistance into confection and oilseed parental lines, thus facilitating the development of disease-resistant hybrids.

Seed of the germplasm populations will be maintained by the authors. Small quantities of seed are available by contacting the authors. We ask that appropriate recognition be made if these germplasm populations contribute to the development of new breeding lines, germplasms, or hybrids.

J.F. Miller* and T.J. Gulya (6)

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Registration of Four High Linoleic Sunflower Germplasms

Four high linoleic sunflower (*Helianthus annuus* L.) germplasms were developed and released by the USDA-ARS, Fargo, ND, and the North Dakota Agricultural Experiment Station, Fargo, ND. HA 413 (Reg. no. GP-247, PI 607504) and HA 414 (Reg. no. GP-248, PI 607505) are oilseed maintainer germplasms, and RHA 415 (Reg. no. GP-249, PI 607506) and RHA 416 (Reg. no. GP-250, PI 607507) are oilseed restorer germplasms, released in 1997. These germplasms produced hybrids which were 60 to 80 g kg^{-1} higher in linoleic acid content than normal check hybrids presently grown in the USA. A high stable linoleic acid content was produced by these hybrids in different environments of the USA.

HA 413 and HA 414 are F_5-derived F_6 maintainer germplasms selected from the cross HA 821/2698-1. HA 821 was released by the USDA and the North Dakota Agricultural Experiment Station in 1986 (1). The plant selection 2698-1 was from a high linoleic acid population obtained from Dr. Doug George, Department of Primary Industries, Warwick, Queensland, Australia. Plants within this population varied considerably in morphological characteristics such as height, branching, and male fertility. Plant 2698-1 was selected for its single-headed and male fertile characteristics. Fatty acid analysis indicated that the oil of plant selection 2698-1 had ≈780 g kg^{-1} linoleic acid. HA 413 and HA 414 were developed utilizing the pedigree breeding method.

RHA 415 and RHA 416 are F_5-derived F_6 restorer germplasms selected from the cross RHA 274/2696-1. RHA 274 is a restorer line released by the USDA and the Texas and North Dakota Agricultural Experiment Stations in 1973 (2). Plant selection 2696-1 was also from the high linoleic population obtained from Australia mentioned above, and was selected for its upper stem branching and male fertile characteristics. Fatty acid analysis indicated that the oil of plant 2696-1 had ≈760 g kg^{-1} linoleic acid. RHA 415 and RHA 416 were developed utilizing the pedigree breeding method and possess genes for fertility restoration of the PET1 cytoplasmic male sterility.

Hybrids with the cytoplasmic male sterile lines of the two maintainer germplasms, HA 413 and HA 414, were produced by crossing with the two restorer lines, RHA 415 and RHA 416. The hybrids were planted at Fargo, ND, in 1994 and 1996, Casselton, ND, in 1995, and at Ralls, TX, in 1995 and 1996. The Texas site was provided by Triumph Seed Co., Ralls, TX. Check hybrids planted from 1994 to 1996 included Hybrid 894, Hybrid cmsHA 821/RHA 274, Mycogen 658, and Triumph 545.

The average linoleic acid content of the check or traditional hybrids planted in North Dakota over the 3 yr of testing was 580 g kg^{-1}, while the average linoleic acid content of the high linoleic hybrids planted in North Dakota was 663 g kg^{-1}. The advantage of the high linoleic hybrids over the checks was significant, averaging 83 g kg^{-1}. The average linoleic acid content of the check or traditional hybrids planted in Texas over the two years of testing was 452 g kg^{-1}, whereas the average linoleic acid content of the high linoleic hybrids planted in Texas was 644 g kg^{-1}. The advantage of the high linoleic hybrids over the checks grown in Texas was significant, averaging 192 g kg^{-1}. The difference between the high linoleic hybrids grown in North Dakota and Texas was only 19 g kg^{-1}, indicating that the high linoleic hybrids were stable in producing linoleic acid content in hybrids over environments.

The average linoleic acid content of hybrids produced by the maintainer germplasms HA 413 and HA 414 was 685 and 686 g kg^{-1}, respectively. The average linoleic acid content of hybrids produced by the restorer germplasms RHA 415 and RHA 416 was 681 and 664 g kg^{-1}, respectively. The highest linoleic content (779 g kg^{-1}) was produced by the cross cmsHA 413/RHA 415.

Seed of these germplasms will be available from the authors. We ask that appropriate recognition be made if these germplasms contribute to the development of new breeding lines or hybrids.

J.F. Miller* and B.A. Vick (3)

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Registration of PS-6ne, PS-6L°, PS-6neL°, P62ne, P62L°, and P62neL° Extra-long Staple Cotton Germplasm

Six germplasm lines of Pima cotton (*Gossypium barbadense* L.), possessing the morphological traits okra-leaf, nectariless, and the okra-leaf nectariless combination (Reg. no. GP-708 to GP-713, PI 613118 to 613123) were developed and released in 1999 by the USDA-ARS in cooperation with the University of Arizona. The okra-leaf trait has been demonstrated to confer earlier maturity and partial resistance to the silverleaf whitefly {*Bemisia tabaci* (Gennadius) [Strain B = *B. argentifolii* (Bellows and Perring)]}. The nectariless trait confers partial resistance to the pink bollworm [*Pectinophora gossypiella* (Saunders)]. The two traits, alone and in combination were introgressed into early-maturing and full-season genetic backgrounds.

The six germplasm lines, PS-6ne, PS-6L°, PS-6neL°, P62ne, P62L°, and P62neL°, were developed by backcross breeding. The duplicate recessive alleles ne_1ne_2, the dominant L_2° allele, and their combination, were transferred to the cultivar 'Pima S-6' (1) and the early-maturing germplasm line P62 (4) from okra-leaf and nectariless lines in a 'Pima S-5' (3) background. Pima S-5 was developed by the USDA-ARS from the cross of the experimental strain 3-79 × S1 × S1 78-567-228-325 with 'Pima S-4' (2). Pima S-6 (PS-6) was developed by the USDA-ARS from the cross of experimental strains 5934-23-2-6 and 5903-98-4-4 (1). The P62 parent derives from the cross of experimental strains 6503-33-3-1 and 6614-91-11 (4). Lines PS-6L°, PS-6ne, and P62ne were developed through four backcross cycles; PS-6neL° was developed through three backcross cycles, and P62L° and P62neL° were developed through two backcross cycles. Backcrossing was accompanied in each backcross cycle by individual plant selection in the F_2 generation, followed by F_3 progeny row selection. Selection was for field performance and fiber quality. In the final backcross cycle, individual plant selection was practiced in the F_3 generation and seed from selected plants were bulked to create PS-6L°, PS-6ne, PS-6neL°, P62L°, P62ne, and P62neL°.

Yield, earliness of maturity, and fiber traits of the six germplasm lines were compared with PS-6 and P62 in replicated tests at Maricopa and Safford, AZ, in 1998. Significant genotype differences and genotype by environment interactions for yield were observed among the lines. PS-6neL° produced 22% more yield than its recurrent PS-6 parent at the low desert Maricopa location where heat stress occurred. At the

higher elevation location, Safford, AZ, PS-6neL° produced 23% less yield than PS-6. P62L° and P62neL° each produced 21% less lint yield than P62 at Maricopa, while at Safford, they produced 31% and 45% less yield, respectively, than P62. The nectariless lines PS-6ne and P62ne produced less yield than their recurrent parents at Maricopa, AZ (15% and 10%, respectively), but equivalent yields at the Safford location. In tests of earliness (measured in sequential harvests), PS-6neL° and PS-6L° matured 44 and 43% of their total yields 162 d after planting; an increase of 18 and 17%, respectively, over PS-6. P62neL° matured 58% of its total yield 162 d after planting; an increase of 20% over P62 and 32% over PS-6. The P62L° line matured 10% more of its total yield after 162 d than did P62 and 22% more than did PS-6. All lines were within the extra-long staple fiber classification limits; however, the dual trait PS-6neL° and P62neL° lines were shorter and weaker than their recurrent parents. The line P62neL° had a lower micronaire reading than its P62 parent.

Small quantities of seed (25 g) are available to cotton breeders, geneticists, and other research personnel upon written request to R.G. Percy, USDA-ARS, Maricopa Agricultural Center, 37860 W. Smith-Enke Road, Maricopa, AZ 85239. It is requested that appropriate recognition of the source be given when these germplasm lines contribute to the development of a new breeding line, hybrid, or cultivar. Genetic material of this release will be deposited in the National Plant Germplasm System where it will be available for research purposes, including development and commercialization of new cultivars.

R.G. Percy* (5)

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Registration of DMK93-9048 Soybean Germplasm with Resistance to Foliar Feeding Insects and Stem Canker and Possessing High Protein

Soybean [*Glycine max* (L.) Merr.] germplasm line DMK93-9048 (Reg. no. GP-276, PI 614007) was developed by the USDA-ARS, Stoneville, MS, in cooperation with the Mississippi Agric. and Forestry Exp. Stn., Stoneville, MS, and released April 1999. This line has value as a parent because it possesses high protein and is highly resistant to foliar feeding by the soybean looper [*Pseudoplusia includens* (Walker)] and southern stem canker [caused by *Diaporthe phaseolorum* (Cooke & Ellis) Sacc. var. *meridionalis* F.A. Fernandez].

DMK93-9048 is an F_3-derived line from the cross D86-3429 × 'Braxton' (2,3). D86-3429 is a breeding line having a high level of resistance to the soybean looper and southern [*Meloidogyne incognita* (Kofoid & White) Chitwood] and peanut [*M. arenaria* (Neal) Chitwood] root-knot nematodes. In 1991, 968 F_2 plants were evalauted for soybean looper feeding in a field cage (4) where moths were released for egg-laying at Stoneville, MS. When the check 'Centennial' (1) showed 95% or more defoliation, 39 F_2 plants having the least defoliation were selected for harvest. In 1992, single plant selections were made from the $F_{2:3}$ lines grown in a field nursery at Stoneville on the basis of agronomic qualities and the lines showing little feeding by soybean looper in the field cage. The $F_{3:4}$ rows were selected in 1993 on the basis of growth type and agronomic qualities. In addition to the single rows, seed from the corresponding $F_{3:4}$ lines were grown in a field cage for reevaluation of soybean looper resistance.

Additional seedlings from the $F_{3:4}$ lines were evaluated for resistance to stem canker by inoculating 10 plants per line with sterile toothpicks cultured with the pathogen. Fifteen lines were selected as having resistance to both soybean looper and stem canker plus possessing desirable agronomic traits. In the winter of 1993 to 1994, these 15 lines were screened in a greenhouse at Stoneville for tolerance to metribuzin, 4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one. These advanced lines were evaluted in replicated field trials for seed yield in 1994 at Stoneville and near Rolling Fork, MS. Yield of DMK93-9048 was 128% of the yield of its adapted parent Braxton at Stoneville, and 93% of the yield of Braxton at Rolling Fork. Five lines were further evaluated in the Uniform Soybean Tests, Southern Region, Preliminary Group VII at seven locations in 1995 (5). In those tests, the mean seed yield of DMK93-9048 was 67% of the yield of 'Stonewall' (6).

DMK93-9048 is of Maturity Group VII, averaging 2 d later than Stonewall (5). It has a determinate stem termination, white flowers, gray pubescence, and tan pod walls. Seed are yellow with buff hilia, averaging 152 mg per seed (5). Seed protein and oil average 462 and 200 grams per kilogram, compared with 440 and 201 for Braxton. Seed protein and oil concentrations are means from seed samples taken from three replications at locations in six southern states (5). DMK93-9048 is tolerant to metribuzin and has shown resistance to southern root-knot nematode and moderate resistance to peanut root-knot nematode in greenhouse tests at Jackson, TN (5). It is susceptible to the soybean cyst nematode (*Heterodera glycines* Ichinohe).

A sample of 50 seeds will be available for at least five years for research purposes by writing the corresponding author.

M.M. Kenty, L.D. Young, and T.C. Kilen* (7)

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Registration of WCL-LY2 High Oil *Lesquerella fendleri* Germplasm

Lesquerella [*Lesquerella fendleri* (A. Gray) S. Watson] germplasm line WCL-LY2 (Reg. no. GP-31, PI 613131) was released in 1999 by the Agricultural Research Service, U.S. Department of Agriculture at the U.S. Water Conservation Laboratory, Phoenix, AZ. WCL-LY2 had improved oil content, lesquerolic acid yield, and seed yield compared with previously released germplasm lines. This germplasm should be suitable for geographic regions similar to the arid southwestern U.S. Plants were developed through mass selection with seed originating from WCL-LY1(1).

Five hundred plants of open-pollinated WCL-LY1 were individually harvested at random from a field grown population at The University of Arizona, Maricopa Agricultural Center (MAC), Maricopa, AZ, in the Spring of 1997. Seed from each plant was evaluated for oil quantity, lesquerolic acid quantity, lesquerolic acid yield (oil content multiplied by lesquerolic acid content), and seed yield per plant. Selection was based on lesquerolic acid yield. Seed yield was measured but was not a factor in the selection. Total seed oil content was measured using a calibrated Pulsed NMR analyzer and fatty acid analysis by gas chromatography (2). Seed from 50 individual plants with the highest lesquerolic acid yield were blended and planted in the fall of 1997. Plants were randomly intermated by natural insect pollination. The process was repeated the following season (1998), and after oil, fatty acid, and seed yield analysis, the resulting population was designated WCL-LY2. An irrigated yield trial that included WCL-LY2, WCL-LO1 (a previous germplasm released for improved oil), WCL-LH1 (a previous germplasm released for improved lesquerolic acid), WCL-LY1 (a previous germplasm released for improved lesquerolic acid yield) (1), and a control entry derived from a 1986 bulk line (3), was planted at MAC, Maricopa, AZ, and at the Campus Agricultural Center, Tucson, AZ, in a completely randomized block design with four replications. The 1986 bulk line was chosen as a control because original selections were made from this population.

At Maricopa, seed oil quantity of WCL-LY2 was 294 g kg^{-1}, which was significantly higher ($P < 0.001$) using a t test, than the 264 and 244 g kg^{-1} for WCL-LO1 and the check line, respectively. At Tucson, seed oil of WCL-LY2 was 267 g kg^{-1}, also significantly higher ($P < 0.001$) than the 248 and 240 g kg^{-1} for WCL-LO1 and the check line. Lesquerolic acid quantity of WCL-LY2 was 541 g kg^{-1} at Maricopa and significantly higher ($P < 0.05$) than the 535 g kg^{-1} for the check line but not higher than the 539 g kg^{-1} of WCL-LH1. At Tucson, WCL-LY2 had 531 g kg^{-1} lesquerolic acid and was not significantly different from WCL-LH1 or the check line. We have found only a narrow range of genetic variation for lesquerolic acid with little selection response within *L. fendleri* germplasm (3); however, lesquerolic acid yield (oil content multiplied by lesquerolic acid content) was always significantly higher in WCL-LY2 compared with WCL-LY1 and the check line due to the improved seed oil quantity at both Maricopa and Tucson. Lesquerolic acid yield of WCL-LY2 was 145 g kg^{-1} at Maricopa compared with 139 and 132 g kg^{-1} for WCL-LY1 and the check line, respectively. At Tucson, lesquerolic acid yield of WCL-LY2 was 142 g kg^{-1} compared with 132 and 127 g kg^{-1} for WCL-LY1 and the check line.

Plant height and plant weight at harvest of WCL-LY2 averaged 30 cm and 208 g in Maricopa, 26 cm and 120 g in Tucson, and were not significantly different than other lines tested. At Maricopa, WCL-LY2 yielded 35.5 g $plant^{-1}$, which was significantly higher than 27.1 g $plant^{-1}$ of the check line. At Tucson, seed yield of 24.1 g $plant^{-1}$ was not significantly different from the check line at 22.0 g $plant^{-1}$.

Plants begin flowering in early February and reached full flowering by mid-April when planted in October in Arizona. Plants require insect pollinators for seed–set.

Limited quantities of seed are available for distribution to qualified researchers upon written request to the corresponding author. Recipients of seed are asked to make appropriate recognition of the germplasm source if used in the development of a new cultivar, germplasm, parental line, or genetic stock. Requests from outside the USA should be accompanied by the appropriate customs control documents.

D.A. Dierig,* P.M. Tomasi, and G.H. Dahlquist (4)

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Registration of WCL-SL1 Salt Tolerant *Lesquerella fendleri* Germplasm

Lesquerella [*Lesquerella fendleri* (A. Gray) S. Watson] germplasm WCL-SL1 (Reg. no. GP-32, PI 613132) was released in 1999 by the Agricultural Research Service, U.S. Department of Agriculture at the George E. Brown Jr., Salinity Laboratory, Riverside, CA, and U.S. Water Conservation Laboratory, Phoenix, AZ. WCL-SL1 has improved salt tolerance compared with unselected lines and was developed through intermating of single plant selections from saline treatments in outdoor sand tanks.

The selection population originated from a 1986 seed bulk. This seed population was chosen since it was previously used in a preliminary, 2 yr field experiment under saline conditions at the Irrigated Desert Research Station, Brawley, CA (1). It consisted of equal proportions of one accession from Arizona and nine from Texas (2). The accession from Arizona was PI 311165. The Texas accessions were PI 293005, PI 293006, PI 293007, PI 293009, PI 293010, PI 293012, PI 293013, PI 293015, and PI 293016.

In December 1997, transplants were established in outdoor sand tanks, 1.5- by 3.0- by 2.0-m deep filled with washed sand (3). Immediately following transplanting, daily irrigations of a complete nutrient solution were applied with an electrical conductivity (EC) of 3 dS m^{-1} and consisting of (in mol m^{-3}): 21.5 Na^+, 3.5 Ca^{2+}, 2.5 Mg^{2+}, 6.0 K^+, 10.9 SO_4^{2-}, 7.0 Cl^-, 5.0 NO_3^-, 0.17 KH_2P0_4, 0.05 Fe (as sodium ferric diethyleneamine pentaacetate), 0.023 H_3BO_3, 0.005 $MnSO_4$, 0.0004 $ZnSO_4$, 0.0002 $CuSO_4$, and 0.0001 H_2MoO_4 made up with Riverside, CA, municipal water. Two weeks after seedlings were transplanted, eight salinity treatments were imposed with irrigation waters designed to simulate saline drainage waters commonly present in the San Joaquin Valley, CA. The composition of these drainage waters is typically a mixture of Na^+, SO_4^{2-}, Cl^-,

Mg^{2+}, and Ca^{2+} predominating in that order. Electrical conductivities of the saline treatments were increased to the desired levels by incremental additions of these five salts over a 9 d period. The experiment consisted of three replications of eight salinity irrigation treatments with EC values of 3, 6, 9, 12, 15, 18, 21, and 24 dS m^{-1} in a completely randomized block design. There were eight tanks for each block corresponding to the eight salinity treatments. In February, irrigations were reduced to every other day.

Salinity had little effect on plant survival until EC of the irrigation waters exceeded 18 dS m^{-1}. The highest salinity treatments, 21 and 24 dS m^{-1}, reduced survival to 9%, and these were thus the only treatments used for selection purposes. When the surviving plants were flowering in early April 1998, mature and open flowers were removed and 18 plants were transplanted into a single, caged sand tank and intermated using bees as pollinators. The EC in this tank was gradually decreased over a period of 7 d to 3 dS m^{-1} to optimize seed production. Seed from 13 plants from the 21 dS m^{-1} and five from the 24 dS m^{-1} treatments was harvested. All plants were harvested in June of 1998.

In October 1998, full-sib progeny of this germplasm, designated WCL-SL1, were compared with the original parental line (the 1986 bulk) and an unselected line segregating 1:1 for male sterility, designated 'line 54.' The three lines were seeded into each of 21 outdoor sand tanks in a randomized complete block design replicated three times in a split-plot arrangement with salinity level as the main plots and the germplasm entry as the sub-plots. There were seven tanks for each replicate corresponding to the seven salinity treatments. The treatments were 3 (tap water equivalent, control), 7, 11, 15, 18, 21, and 24 dS m^{-1}. Surviving plants in the 18, 21, and 24 dS m^{-1} plots were hand self-pollinated and then pollination bags were applied throughout the months of April and May 1999 to further select for salt tolerance. This was an alternative to transplanting surviving plants into a single tank with a screened cage for pollinators since the reduced light under the screen limited plant growth in the previous year.

WCL-SL1 had significantly higher survival rates following salination than unselected lines in treatments up to 24 dS m^{-1}. WCL-SL1 had 81% plant survival in the 21 dS m^{-1} treatment compared with 29 and 46% for line 54 and the 1986 bulk, respectively ($P < 0.001$). WCL-SL1 in the 24 dS m^{-1} treatment had a 20% survival rate compared with 0 and 5% for line 54 and the 1986 bulk, respectively ($P < 0.001$). No significant differences in plant survival were found among lines in the 3 dS m^{-1} (tap water equivalent, control) and the 7 dS m^{-1} treatments.

Plant heights were measured on 11 March 1999. Plants began flowering in early February and continued until the end of May. WCL-SL1 plants were significantly taller ($P < 0.001$) than unselected lines in all treatments. At the highest salinity treatment, 24 dS m^{-1}, there were only a few surviving plants from either line 54 or the 1986 bulk.

Seed yields of WCL-SL1 in the 3, 7, 11, 15, and 18 dS m^{-1} salinity treatments were between two and five times greater than line 54 and the 1986 bulk. Seed yields of the two highest salinity levels were not measured since plants were bagged to obtain self-pollinated seed. The lowest seed yield (0.45 g $plant^{-1}$) occurred in the 18 dS m^{-1} treatment for WCL-SL1. The highest (1.52 g $plant^{-1}$) occurred in the 11 dS m^{-1} treatment; however, even at the 3 dS m^{-1}, seed yield of WCL-SL1 was still significantly higher than the mean seed yield of the two unselected lines ($P < 0.001$). Highest seed yield for all lines were obtained at treatments 11 and 15 dS m^{-1}. There were no differences in seed oil content (172 g kg^{-1} average) or in lesquerolic acid (486 g kg^{-1} average) among WCL-SL1 and unselected lines.

Limited quantities of seed are available for distribution to qualified researchers upon written request to the corresponding author. Recipients of seed are asked to make appropriate recognition of the germplasm source if used in the development of a new cultivar, germplasm, parental line, or genetic stock. Requests from outside the USA should be accompanied by the appropriate customs control documents.

D.A. Dierig,* M.C. Shannon, and C.M. Grieve (4)

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Registration of ICCV 96029, a Super Early and Double Podded Chickpea Germplasm

ICCV 96029 chickpea (*Cicer arietinum* L.) (Reg. no. GP-214, PI 612869) was developed and released by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, (near Hyderabad), India as the earliest flowering chickpea germplasm known in the world. ICCV 96029 is a super early chickpea and flowers about 23 to 27 d after sowing at ICRISAT (17.6°N, 500 m asl). The earliest flowering previous chickpea cultivar, ICCV 2, flowered in about 30 to 35 d (1). Control cultivars such as Annigeri, Kranthi and ICCV 10 require 45 to 50 d for flowering. Thus, ICCV 96029 is an additional source of genes for early flowering.

ICCV 96029 is an F_6 selection from cross 910253, ICCV 2 × ICCV 93929. The pedigree of ICCV 2 is ICCX-752770-13P-2P-BP derived from a cross F_3 [(K 850 × GW 5/7) × P 458] × F_3 (L 550 × Guamuchil)-2. The other parent ICCV 93929 was selected as ICCX-880355-BH-BP-46H-BP-BH from a cross of ICC 1069 × CTCPS 50467. ICCV 96029 was derived by the pedigree method where plants were selected from the F_2 to F_5. It was tested under selection number ICCX-910253-27P-2P-1P-1P-BP.

ICCV 96029 exhibits better early growth vigor (EGV) in terms of morphological traits compared with either of its parents. ICCV 96029 grew taller, produced more branches and had a wider plant canopy when compared with the ICCV 2 parent during the first month. This appears to give an advantage to ICCV 96029 for utilizing available moisture more efficiently; however, the parental lines eventually closed the canopy and were taller than ICCV 96029 at maturity. ICCV 96029 is a double-podded line, a character known to confer a yield advantage in short season and drought-prone environments.

Relatively superior EGV of ICCV 96029 is useful to better utilize soil moisture in early growth stages in the postrainy season when chickpea is normally grown. This line matures in 75 to 76 d at ICRISAT, Patancheru and is about 10 to 15 d earlier than ICCV 2. Both early flowering and maturity may help extend chickpea cultivation to shorter season environments than where the crop is presently grown.

Information on flowering and maturity of this line was collected at Hisar (29° N), India, a subtropical location in a major chickpea growing area, where the temperatures during chickpea growing season are low (minimum 3^0 C–14^0 C and maximum 15^0 C–30^0 C). ICCV 96029 flowered in 41 d and matured in 128 d compared with the popular cultivar Pant G-114, which required 83 d to flower and 155 d to mature (2). If short-duration genotypes such as ICCV 96029 become available for subtropical environments in South Asia, chickpea productivity may increase and stabilize at a higher level. An earlier maturing crop could escape end-of-season drought and avoid losses caused by Helicoverpa [*Helicoverpa armigera* (Hübner)] pod borer and foliar diseases such as ascochyta blight [caused by *Ascochyta rabiei* (Pass.) Labr.] and botrytis gray mold [caused by *Botrytis cinerea* Pers. Ex Fr.].

Seed for research purposes is available on request to the Genetic Resources and Enhancement Program at ICRISAT.

Jagdish Kumar* and B.V. Rao (3)

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Registration of Large-Seeded USWA-12 and USWA-13 Virus-Resistant Great Northern Dry Bean Germplasms

Two large-seeded great northern dry bean (*Phaseolus vulgaris* L.) germplasms USWA-12 (Reg. no. GP-215, PI 613345) and USWA-13 (Reg. no. GP-216, PI 613346) with resistance to Bean Common Mosaic Virus (BCMV) and Curly Top Virus (CTV) were released jointly by the USDA-ARS, the Agricultural Research Center of Washington State University, and the Agricultural Experiment Stations of University of Idaho and Oregon State University.

USWA-12 (seed lot no. 95-2115) is an $F_{5:12}$ line from the cross GN-WM-85-45//JM-24/'Limelight.' GN-WM-85-45 is a white mold (caused by *Sclerotinia sclerotiorum* (Lib.) de Bary) tolerant breeding line developed by D. Coyne at the University of Nebraska. It was a sister line to the Nebraska great northern 'Starlight,' which has large, bright-white seed. JM-24 is a USDA great northern germplasm line developed by D.W. Burke et al. (1). It has dominant *I* resistance to BCMV and to CTV (1). Limelight is a very early, large, flat, white-seeded bush cultivar that was released in Canada as a substitute for lima bean. USWA-12 has *I* gene resistance to BCMV and complete resistance to CTV. USWA-12 has an indeterminate, upright vine with long tendrils and Type II-B growth habit. Pods are set from low to high on the plant. USWA-12 was tested at Othello, WA, every year since 1993. Yield of USWA-12 is comparable to Starlight and about 4% greater than 'US 1140,' and seed size is larger than Starlight (47 g 100 seeds^{-1} vs 38 g 100 seed^{-1}, respectively). It is a late-season bean maturing 3 to 4 d later than Starlight.

USWA-13 (seed Lot no. 95-2921) is an $F_{7:12}$ bulk population from the cross JM-24/'Anfa'//GN-WM-85-45. Anfa is an upright, short-vined, small-seeded great northern type developed in France by E. Max, Legrains Calliard Co. It has resistance to BCMV, anthracnose [caused by *Collectotrichum lindemuthianum* (Sacc. & Magnus) Lams.-Scrib.] and halo blight [caused by *Pseudomonas syringae* pv. *phasiolicola* (Burkholder) Young et al.]. USWA-13 has a type II-B growth habit; maturity and yields were close to 'UI-59' and 'Alpine' in Washington and Idaho sites of the 1995 Cooperative Dry Bean Nursery Trial (2). Seed size was much larger, 38 to 41 g 100 seed^{-1} vs 32 to 35 g 100 seed^{-1} for commercial great northern cultivars. The seed is plump and bright white color which was obtained from the GN-WM-85-45 parent. USWA-13 has dominant *I* gene resistance to BCMV, but occasionally showed a trace of CTV in the field, indicating possible variability for this character. It may have only one of the two dominant resistance factors.

A limited quantity of seed of these two lines is available from Phillip Miklas, USDA-ARS or An N. Hang, WSU-IAREC, 24106 N. Bunn Road, Prosser, WA 99350-9687. It is requested that appropriate recognition be made if this germplasm contributes to the development of a new breeding line or cultivar. Genetic material of this release will be deposited in the National Plant Germplasm System where it will be available for research purposes, including development and commercialization of new cultivars.

An N. Hang,* M.J. Silbernagel, and P.N. Miklas (3)

References and Notes

1. Burke, D.W., J.P. Meiners, M.J. Silbernagel, J.M. Kraft, and H.H. Koehler. 1995. Registration of pinto GH-196, pink UNS-117 and 6R-42, and great northern JM-24 dry bean germplasms. Crop Science 35:945.
2. Stewart-Williams, K., and J.R. Myers. 1995. 46th Annual Report of the National Cooperative Dry Bean Nurseries. Univ. Of Idaho, College of Agric. Exp. Station. SP 17.
3. A.N. Hang, Washington State Univ., Irrig. Agric. Res. Ext. Center, 24106 N. Bunn Road, Prosser, WA 99350; M.J. Silbernagel (retired) and P.N. Miklas, USDA-ARS, Irrig. Agric. Res. and Ext. Center, 24106 N. Bunn Road, Prosser, WA 99350. Contribution of the Washington State Univ. Agric. Res. Ctr. In cooperation with USDA-ARS, Prosser, WA. Manuscript no. 0002-27. Registration by CSSA. Accepted 30 Sept. 2000. *Corresponding author (ahang@tricity.wsu.edu).

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